IN THE CLAIMS

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1. (Currently amended) A method of forming a high spatial resolution perspective rendering from a low spatial resolution voxel data set, comprising:

(a) raycasting at least one ray from a predetermined location into the voxel space, by sampling points along said ray in a space defined by said voxel data set;

(b) accumulating the effect of opacity along the ray path, using opacity values at said sampling points, into a ray storage value;

(c) associating points along the cast ray with material classes~~, each material class of a plurality of possible material classes being associated with a set of opacity values~~;

(d) determining if a ray passes from a point in a first material class to a point in a second material class~~. using on the opacity values of the points~~;

~~(e) providing at least one association of a boundary visualization value with a boundary between two different material classes;~~

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(e~~f~~) if the ray is determined to pass between classes, accumulating a boundary visualization-value associated with a boundary between the two classes into said ray storage value; ~~and~~

(f~~g~~) repeating at least (a), (b), (d), and (e~~f~~) for a plurality of cast rays; and

(g~~h~~) forming a high spatial resolution perspective rendering from said determining ray storage values.

2. (Currently amended) A method according to claim 1, comprising determining the location of said boundary in (e~~f~~) during said ray casting.

3. (Previously presented) A method according to claim 2, wherein said boundary is set to be at a position between said two points of different classes.

4. (Currently amended) A method according to claim 2, wherein said boundary is ~~determining~~ determined by examining at least one addition sampling point between the two points of different classes.

5. (Previously presented) A method according to claim 4, comprising repeating examining sampling points between points of different classes, until a desired precision of boundary determination is achieved.

6. (Previously presented) A method according to claim 1, comprising calculating said boundary visualization value during said ray casting.

7. (Previously presented) A method according to claim 6, wherein determining a visualization value comprises determining a normal to said boundary at said point.

8. (Previously presented) A method according to claim 1, comprising:

providing an index array indicating for at least some of said voxels if a class-boundary does not pass near the voxel.

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9. (Previously presented) A method according to claim 8, comprising:

avoiding said determining in (d) if a sampled point has a negative indication in said index array.

10. (Currently Amended) A method according to claim 8, comprising:

reusing an opacity value from a previous sampled point, if a sampled point has a negative indication in said index array.

11. (Previously presented) A method according to claim 8, wherein said index array is generated by setting a value indicating a lack of a boundary for all voxels that are surrounded by voxels in a same class.

12. (Previously presented) A method according to claim 1, wherein said associated boundary visualization value comprises a surface lighting calculation of said boundary.

13. (Previously presented) A method according to claim 1, comprising stopping said ray casting if said accumulated opacity is over a threshold.

14. (Previously presented) A method according to claim 1, wherein said sampling points are separated by a step size and wherein said step size is dependent on the opacity value at the sampling points.

15. (Previously presented) A method according to claim 14, wherein said step size is always smaller than a voxel cross-section along the path of the cast ray.

16. (Currently amended) A method according to claim 14, wherein said step size is dependent on an opacity at a currently sampled point.

17. (Previously presented) A method according to claim 14, wherein said step size is dependent on the opacities of neighboring voxels to the currently sampled point.

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18. (Previously presented) A method according to claim 1, comprising providing a definition of voxel value intervals for each class, prior to said ray casting.

19. (Currently amended) A method according to claim 1, wherein the opacity value of at least some of the sampling points is determined by ~~comprising~~:

interpolating between voxels near said point; and

transforming said interpolated voxel value into an opacity value for said point.

20. (Previously presented) A method according to claim 19, wherein said interpolation is dependent on a distance between said sampled point and said vantage point.

21. (Previously presented) A method according to claim 20, wherein said interpolation varies between a cubic interpolation for nearby points and a linear interpolation for far points.

22. (Currently amended) A method according to claim 1, wherein said ~~predetermining~~ predetermined location is within the voxel space.

23. (Previously presented) A method according to claim 1, wherein said voxel data set comprises a medical imaging data set.

24. (Currently amended) A method according to claim 1, wherein (~~f~~g) comprises:
sparely casting rays; and
determining if to cast at least one additional ray between cast rays.

25. (Previously presented) A method according to claim 24, wherein determining if to cast said at least one additional ray comprises determining if said neighboring rays to said additional ray have statistically homogeneous ray storage values.

26. (Previously presented) A method according to claim 25, wherein statistical homogeneity is determined with respect to the ray storage values.

27. (Previously presented) A method according to claim 25, wherein statistical homogeneity is determined with respect to depth factors associated with the ray.

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28. (Currently amended) A method according to claim 1, wherein (~~g~~h) comprises interpolating between stored values of cast rays.

29. (Currently amended) A method according to claim 1, wherein (~~f~~g) comprises progressively increasing the density of raycasting.

30. (Previously presented) A method according to claim 29, wherein the progressively cast rays are cast in parallel.

31. (Previously presented) A method according to claim 29, wherein additional cast rays are cast to progressively generate nested levels of resolution in the formed image.

32. (Previously presented) A method according to claim 1, comprising rendering said formed perspective rendering on a display.

33. (Previously presented) A method according to claim 1, comprising defining a window in or near the voxel space through which to cast said rays.

34. (Previously presented) A method according to claim 33, wherein said window is perpendicular to a provided orientation vector.

35. (Previously presented) A method according to claim 33, wherein said window is flat and rectangular.

36. (Previously presented) A method according to claim 33, wherein said window is curved.

37. (Previously presented) A method according to claim 33, wherein said window is defined by pixels in a uniformly spaced rectangular grid.

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38. (Previously presented) A method according to claim 33, wherein said window is defined by pixels using coordinates which are one of circular coordinates, elliptical coordinates and another conic projection of coordinates.

39. (Previously presented) A method according to claim 1, wherein said accumulation of opacity comprises updating a storage value CT as follows: CT=CT*T^step_size, where T is a transparency value corresponding to the opacity value.

40. (Previously presented) A method according to claim 1, wherein said rays are cast in parallel.

41. (Previously presented) A method according to claim 1, wherein the voxel data set is generated by one of CT (Computerized Tomography), MRI (Magnetic Resonance Imaging), Ultrasound, a geophysical survey, a meteorological survey, a scientific simulation, an animation model having more than two dimensions and a set of simultaneous equations.

42. (Previously presented) A method according to claim 1, wherein each voxel has associated therewith a visual representation value and comprising:

determining a visualization value associated with a sampled point from the voxel associated visual representation values; and

accumulating said point associated visualization value into said stored value.

43. (Previously presented) A method according to claim 42, wherein said visual representation value is a gray scale value.

44. (Previously presented) A method according to claim 42, wherein said visual representation value is a color value.

45. (Previously presented) A method according to claim 42, wherein accumulating said point associated visualization values comprises selectively accumulating values based on front surface detection.

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46. (Previously presented) A method according to claim 42, wherein said point associated visualization value comprises a volume lighting value.

47. (Previously presented) A method according to claim 42, wherein said point associated visualization value comprises a surface lighting value.

48. (Previously presented) A method according to claim 1, wherein advancing along a ray is coordinated with an opacification process.

49. (Previously presented) Apparatus for forming a perspective rendering from a voxel space including:

(a) a memory for storing a voxel data set;

(b) a computer processor for applying the method of claim 1 to said stored data set to form said perspective rendering; and

(c) a second memory for storing said formed perspective rendering.

50. (new) A method according to claim 1, comprising providing at least one association of a boundary between two different material classes and a visualization value.

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51. (new) A method according to claim 1, wherein determining if a ray passes from a point in a first material class to a point in a second material class, comprises determining using opacity values of the points.

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52. (new) A method according to claim 1, wherein the material classes belong to a plurality of possible material classes.